

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Vanessa Z.H. Chan et al.  
Serial No.: 09/720,710  
Confirmation No.: 5662  
Filed: July 2, 1999  
For: PERIODIC POROUS AND RELIEF NANOSTRUCTURED  
ARTICLES  
Examiner: V. S. Chang  
Art Unit: 1794

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Dated: April 17, 2009

Signature:  (Tina M. Hanifin)

**REPLY BRIEF**

Mail Stop Appeal Brief - Patents  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

This Reply Brief is being submitted in response to the Examiner's Answer mailed on February 18, 2009.

The **Status of the Claims** is described on page 2 of this paper.

The **Grounds of Rejection to be Reviewed** appear on page 3 of this paper.

**Remarks** appear on page 4 of this paper.

**STATUS OF CLAIMS**

A. Total Number of Claims in Application

This case was initially filed with 148 claims (claims 1-148). There are currently 4 claims pending and under consideration. The status of each of the claims as initially filed is summarized below. A copy of the claims as pending was included in Applicant's Appeal Brief.

B. Current Status of Claims

1. Claims canceled: None.
2. Claims withdrawn from consideration but not canceled: 2-16, 18-22, and 25-148.
3. Claims pending: 1-148.
4. Claims allowed: None.
5. Claims rejected: 1, 17, 23, and 24.

C. Claims On Appeal

The claims on appeal are claims 1, 17, 23, and 24.

**GROUND OF REJECTION TO BE REVIEWED ON APPEAL**

Review is sought of the rejection of claims 1, 17, and 23 under 35 U.S.C. §102(b) as being anticipated by Lee et. al., *Macromolecules* **1989**, 22, 2602-2606 ("Lee"), as well as the rejection of claim 24 under 35 U.S.C. §102(b) as being anticipated by Lee, or, in the alternative, under 35 U.S.C. §103(a) as obvious over Lee.

**REMARKS****I. Arguments Concerning the Rejection of Claims 1, 17, and 23 under 35 U.S.C. §102(b)**

In the Examiner's Answer, the rejection of claims 1, 17, and 23 under 35 U.S.C. §102(b) as being anticipated by Lee et. al., *Macromolecules* **1989**, 22, 2602-2606 ("Lee") has been maintained. The Examiner's Answer primarily reiterates the same grounds of rejection presented in the Final Office Action, asserting that Lee discloses a polymeric article as described in claim 1.

Applicant respectfully disagrees. Contrary to the assertions made by the Examiner, Lee cannot anticipate claim 1 because it does not disclose a polymeric structure comprising both (1) a "three-dimensionally periodic structure" *and* (2) a plurality of periodically occurring separate domains, with at least a first and a second domain each being "topologically continuous," as required by claim 1.

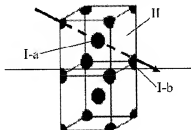
The Examiner's Answer states that, in Lee, "the structure of the original block copolymer film [is] directly reflected in the shape and size of the micropores." Thus, since Lee discloses porous membranes prepared from block copolymers having lamellar or cylindrical morphology (e.g., block copolymers I, II, and IV of Lee), or spherical morphology (e.g., block copolymer V of Lee), the porous membranes disclosed in Lee include only lamellar, cylindrical, or spherical periodic microstructures. As described in Applicant's Appeal Brief, structures having lamellar domains are "one-dimensionally periodic;" structures having cylindrical domains are "two-dimensionally periodic;" and structures having spherical domains are "three-dimensionally periodic," as the terms are used in the specification.

The Examiner has not shown where, in Lee, a polymeric structure comprising both a three-dimensionally periodic structure *and* a plurality of periodically occurring separate domains, with at least a first and a second domain each being topologically continuous, is disclosed. Applicant disagrees with the assertion by the Examiner that "block copolymers I and II form microporous membranes with a three-dimensionally periodic structure." (Examiner's Answer, page 3.) By contrast, Lee clearly indicates that the block copolymers I and II form structures having either a lamellar structure, which is one-dimensionally periodic, or a cylindrical structure, which is two-

dimensionally periodic. For example, Lee states, “the lamellar structures of segregated microdomains were observed on the surfaces of the films of block copolymer I, II, and IV, as shown in Figure 3.” (Please see page 2605 of Lee.) Lee also states that “by SEM observation of the O<sub>3</sub>-oxidized membrane, lamellar-shaped structures with the same sizes as original films were emerged on the surfaces of the membrane (I and II).” (Please see page 2605 of Lee.) Furthermore, Lee indicates that “cylindrical hollows were partly observed in the cross section of membrane (IV).” (Please see page 2606 of Lee.) Thus, since block copolymers I and II, as well as IV, exhibit only lamellar or cylindrical structures, they are not three-dimensionally periodic, as the term is used in the specification.

While the spherical structure disclosed in Lee (e.g., block copolymer V of Lee) exhibits a three-dimensionally periodic structure, the spherical structure does not exhibit *at least two* topologically continuous domains, as required by claim 1. The term “topologically continuous” is specifically defined and consistently used in the specification to describe a domain that is “continuous in the sense that a particular domain in a periodic, polymeric structure forms a continuous pathway through the structure.” (See, for example, page 13, line 32 – page 14, line 2 of the specification.) To further illustrate, Figure B from the Appeal Brief is reproduced below to depict a spherical structure, where domain I is contained within domain II and the dotted line indicates a pathway connecting two spheres (e.g., portions I-a and I-b) of domain I. As shown in Figure B, domain II is topologically continuous, as the term is defined in the specification, but spherical domain I is not topologically continuous.

**Figure B. A periodic structure including spherical domains.**



Thus, the spherical structure disclosed in Lee does not include both a first *and a second* domain that are each topologically continuous, as required by claim 1. In fact, the only description of spherical structure in Lee relates to a structure having discontinuous or discrete pores (e.g., block copolymer V). For example, Lee states, “in the case of block copolymer V, the polyisoprene domain stained with osmium tetroxide becomes discontinuous, suggesting sphere and/or cylinder type microphase separation.” (Please see page 2605 of Lee.) Furthermore, Lee states, “the hollow domain in the cross section of the membrane (V) seems closed corresponding to the discontinuous sphere like microphase separation of the original film.” (Please see page 2606 of Lee.) Thus, since block copolymer V exhibits a spherical structure, it does not exhibit *at least two* topologically continuous domains, as required by claim 1.

Applicant also disagrees with the Examiner’s assertion that “nothing whatsoever has Lee limited its membrane to any particular structure.” (Examiner’s Answer, page 5.) The Examiner seems to argue that Lee discloses a general teaching that, for any block copolymer structure described in Lee, “the poly(isoprene) block is decomposed to form a continuous hollow domain.” (Examiner’s Answer, page 5.) By contrast, Lee clearly indicates that block copolymers having lamellar or cylindrical structures, while not three-dimensionally periodic, can be used to form structures having “continuous hollow domains,” while block copolymers having spherical structures, though three-dimensionally periodic, form structures having discontinuous hollow domains.

Thus, because each claim limitation is not taught or suggested by Lee, claim 1 is patentable over Lee. Dependent claims 17 and 23 stand or fall with claim 1.

## **II. Arguments Concerning the Rejection of Claim 24 under 35 U.S.C. §102(b), or, in the alternative, under 35 U.S.C. §103(a)**

Claim 24 further limits claim 1 by requiring that the polymeric species comprise polymers having an average molecular weight of at least about 30,000 Da. As described in Applicant’s Appeal Brief, Lee does not teach or suggest that any of the polymeric species used to form the structures disclosed in Lee include polymers having an average molecular weight of at least about 30,000 Da. Rather, the Examiner’s calculation of an average molecular weight of 22,000 Da only

teaches polymers having molecular weights not exceeding 22,000 Da, an amount which differs nearly 30% from the average molecular weight recited in claim 24 (e.g., at least about 30,000 Da). For this additional reason, Lee cannot anticipate claim 24.

Furthermore, to support a *prima facie* case of obviousness under 35 U.S.C. §103(a), the Patent Office is required to provide a clear articulation of a reason why the claimed invention would have been obvious in view of the references. (Please see MPEP §2141.) In the present case, the Examiner has not provided a reason as to why one of ordinary skill in the art would modify Lee to predictably produce the invention as claimed, or how one skilled in the art would combine known elements, or substitute one known element for another, to predictably arrive at the invention as claimed.

To the extent that the obviousness rejection of claim 24 can be viewed an implicit rejection of claim 1 as obvious over Lee, the Examiner has failed to make a *prima facie* case for obviousness, because the rejection fails to establish any reason as to why one of ordinary skill in the art would have modified Lee to produce the invention as claimed, nor has the Examiner even alleged that such modification was within the level of skill of one of ordinary skill in the art or would have yielded a predictable result. For this additional reason, this basis for rejection should be reversed.

**CONCLUSION**

In summary, the rejection of claim 1 as anticipated by Lee should be reversed because Lee fails to disclose or suggest a polymeric structure comprising both (1) a “three-dimensionally periodic structure,” *and* (2) a plurality of periodically occurring separate domains, with at least a first and a second domain each being “topologically continuous,” as required by claim 1. The rejection of claims 17 and 23, which depend from claim 1, should also be reversed. The rejection of claim 24 should also be reversed because the underlying basis of the rejection, i.e., that independent claim 1 is anticipated by Lee, is incorrect.

For the foregoing reasons, each of the rejections of the claims was improper and should be reversed.

Dated: April 17, 2009

Respectfully submitted,

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